

Field Test of Plutonium and Thorium from Clay Soils at Mound Using the ACT*DE*CONSM Process

Michael J. Dunn (info@selentec.com; 770-640-7059)

Neil A. Swift (info@selentec.com; 770-640-7059)

SELENTEC

8601 Dunwoody Pl. Suite 302

Atlanta, GA 30350

Richard Neff (Neff_Richard@doe-md.gov; 937-865-3616)

James Johnson (Johnson_James_O@doe-md.gov; 937-865-5334)

Mound Technology Center

1 Mound Avenue

Miamisburg, OH 45343

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William Haslebacher, FETC COR (August 1996 - Present)

Laboratory studies funded by DOE have demonstrated the ability of Selentec's chemical wash technology, ACT*DE*COMSM, to remove plutonium from contaminated clay soils at DOE's Mound facility in Miamisburg, Ohio, and leave in the soil only the most insoluble species of plutonium. Subsequently, the Office of Environmental Management/Office of Science and Technology (EM/OST) Program through the Federal Energy Technology Center has funded a pilot scale treatability test of this process to demonstrate its effectiveness in removing plutonium and thorium from clay soils at the Mound facility. ACT*DE*CONSM is a proprietary soil treatment process developed by Selentec, an Atlanta based technology company. The process involves a highly selective contaminant dissolution process in the form of a chemical wash. Following dissolution of the contaminant from the soil, the wash solution is extracted from the soil and concentrated by reverse osmosis. The chelating agent is separated from the contaminant by pH adjustment and recycled back into the process, along with the reverse osmosis permeate. Finally, pH adjustment of the final concentrate solution results in precipitation of the contaminant, whose volume is equal to a fraction of one percent of the original soil volume.

The demonstration work began during the summer of 1997 and will continue through the fall at the Mound site. The pilot scale process involved pretreatment of the soil in an attrition scrubber using an ACT*DE*CONSM solution. This blended solution was then passed through a counter-current extraction unit where contact with additional ACT*DE*CONSM solution occurred, following by a rinse cycle. During the countercurrent extraction, sand was added to aid in contacting the soil particles with the ACT*DE*CONSM solution. The sand would be separated from the treated soil and recycled in a full scale treatment system.

Three different types of environmental soils were tested - plutonium and thorium contaminated soils with natural clay content, and plutonium contaminated soil taken from the contaminated Miami-Erie canal containing a high percentage of fine clay. The goal of these tests is to reduce plutonium concentration from several hundred pCi/g to less than 75 pCi/g, and thorium concentration from a few hundred pCi/g to less than 15 pCi/g.

In addition, soil classified as “TRU” waste, having plutonium concentration at several hundred nCi/g, will also be treated to determine if the levels can be reduced sufficiently to reclassify the soil as “LSA” waste, which would simplify the disposal process.

The results of these four tests are presented, along with a discussion of the operating parameters and the lessons learned relating to full scale implementation of the ACT*DE*CONSM technology at DOE’s Mound facility, as well as other potential applications of this process.